



AGILE PORT AND HIGH SPEED SHIP TECHNOLOGIES
FY05 FINAL SUMMARY REPORT
Vol. II - PROJECTS 1, 2 and 7

Submitted to:

**Office of Naval Research
875 North Randolph Street, Room 273
Arlington, VA 22203-1995**

**Dr. Paul Rispin, Program Manager
ONR Code 331
703.696.0339
rispinp@onr.navy.mil**

**In fulfillment of the requirements for:
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*Agile Port and High Speed Ship Technologies***

**FY 05 Project 05-1
*Technical Coordination and Planning***

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**Prepared and submitted by:
Center for the Commercial Deployment of Transportation Technologies
California State University, Long Beach Foundation
6300 State University Drive, Suite 220 • Long Beach, CA 90815 • 562.985.7394**

December 31, 2009



AGILE PORT AND HIGH SPEED SHIP TECHNOLOGIES

FY05 FINAL SUMMARY REPORT Vol. II - PROJECTS 1, 2 and 7

**FY 05 Project 05-1, Program Element 5.05
*Technical Coordination and Planning***

**Task 1.1 Project Oversight
Deliverable 1.1c - Final Summary Report**

Submitted by:

**Stan Wheatley, Managing Director
Center for the Commercial Deployment of Transportation Technologies
California State University, Long Beach**

This material is based upon work supported by the Office of Naval Research, under Cooperative Agreement N00014-04-2-0003 with the California State University, Long Beach Foundation, Center for the Commercial Deployment of Transportation Technologies (CCDoTT).

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14. ABSTRACT The FY05 CCDoTT program addressed eight technical development projects and two administrative tasks within the Agile Port and High Speed Ship technology sector. The FY05 Final Summary Report Volume I covering seven of the eight technical projects was submitted on July 2, 2008. Project 05-7, the Pacific Northwest Agile Port System Demonstration, became delayed due to changing requirements directed by the United States Transportation Command. Projects 05-1 and 05-2 provided support to Project 05-7 and were extended for the duration of the project. This report summarizes the results of the remaining three projects in the FY05 program cycle, in particular the PNW Agile Port System Demonstration, a system of moving freight that could result in a 300% improvement in container throughput and terminal efficiency.						
15. SUBJECT TERMS CCDoTT, Agile Port, Agile Port System (APS), Agile Port Demonstration, Technology Transition, USTRANSCOM, Joint Capability Technology Demonstration (JCTD), Efficient Marine Terminal (EMT), Intermodal Interface Center (IIC), inland ports, dedicated freight corridor, Technical Coordination, Strategic Mobility 21 (SM21).						
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Agile Port and High Speed Ship Technologies

FY05 Final Summary Report

Vol. II - Projects 1, 2 and 7

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Agile Port and High Speed Ship Technologies

FY05 Final Summary Report Vol. II - Projects 1, 2 and 7

Executive Summary

1.0 Introduction

The FY05 CCDoTT program addressed eight technical development projects and two administrative tasks within the Agile Port and High Speed Ship technology sector. Volume I of the FY05 Final Summary Report contained 7 of the 8 technical projects and was submitted on July 2, 2008. Project 05-7, Pacific Northwest Agile Port System Demonstration, became delayed due to changing requirements directed by the United States Transportation Command. New statements of work were developed in 2007 and again in 2009 to adjust requirements and deliverable schedules. Two modifications to the Cooperative Agreement and extensions of the project into the FY06/07 period of performance were granted in order to accommodate the evolving requirements. Projects 05-1 and 05-2 provided support to Project 05-7 and were extended for the duration of the project.

Volume II of the FY05 Final Summary Report provides the summary reports of Projects 05-1, 05-2 and 05-7. With the completion of this document all the requirements for FY05 Projects have been met and the FY05 program can be closed out.

The following Executive Summary seeks to convey the principle issues and accomplishments achieved.

1.1 Project 05-1: Technical Coordination and Planning

This project identifies and coordinates diverse technological advancements from an extended set of research partners within CSULB, other universities, governmental agencies and commercial ventures. CCDoTT intends to use its assets to validate research findings and coordinate them into a focused program of action for the advancement and dissemination of transportation technologies. This project encompasses all activities required to ensure the efficient and effective performance of the current and out-year CCDoTT projects. This includes: ensuring quality performance and timely completion within budget for all project tasks; establishing a framework for the following year's activities to advance technological capabilities; and incorporating end user participation into the program development in order to ensure a high probability of eventual operational implementation. Technical Coordination and Oversight is continuous throughout the life of each set of studies and is a critical in gaining the full value added that can be achieved by integrating related portions of separate and/or multi-year projects.

All FY05 projects are now completed and the functions of Technical Coordination smoothly transitioned to the corresponding projects in the CCDoTT FY06 and FY07 program.

1.2 Project 05-2: Technology Transition and Outreach

The Technology Transition project is designed to meet the needs of the stakeholders, with the goal of reaching end users who can develop products or processes aimed at improving commercial competitiveness and military capability. It encompasses extensive outreach activities aimed at remaining in the forefront of technological advances, and acting as a clearinghouse for stakeholders in the transportation industry. Technology Transition works in close collaboration with the Technical Coordination and Planning project to provide critical feedback and direction for CCDoTT's program of action.

CCDoTT serves as an incubator for advanced technology ideas. We take ideas that relate to both military and commercial needs or, as is often the case, are being developed in one of those sectors and can be expanded to the other with significant value added in both sectors, and develop them to the demonstration level. CCDoTT will not build a ship or a final IT system. Rather we take it to the level where the concept or prototype has clearly proven value, or not, and hand it off to an end user that will take it to the next level of completion. This project is focused on finding the end users out of a very large base of potential stakeholders. This is where we accomplish the "Deployment of Transportation Technologies" displayed in our name. This is the critical in the life of any new technology and why a project is dedicated to that goal.

The major programmed accomplishments of this project are the East Coast and West Coast Conferences, usually combined with the Quarterly Reviews required in the Technical Coordination Project 05-1. We have found the Conferences to be very valuable in expanding and informing the stakeholders and potential end users of CCDoTT projects. The outreach portion of this project has expanded on previous years and provides a valuable interaction between the commercial and government entities crucial to the ultimate success of our projects. Membership on the High-Speed Sealift/Agile Ports Action Officers Group (and the Executive Steering Group) has been a valuable association allowing close liaison with high level staff and decision makers with direct interest in many of our projects. The close working relationships established and maintained through the conferences and outreach activities contribute directly to CCDoTT program development focusing commercial and military requirements and guidance for a more responsive program

1.3 Project 05-7: Pacific Northwest Agile Port System Demonstration

The Agile Port System (APS) Demonstration is a seminal set of projects evolving out of an original Operational Concept Document on High-Speed Ships and Agile Ports written for the United States Transportation Command (USTRANSCOM) in 1996. The focus has been on technology and processes that will improve the efficiency of our ports. CCDoTT has developed a concept that contains three main components: Efficient Marine Terminal, Intermodal Interface Centers (or Inland Ports), and a connecting Dedicated Freight Corridor. Over the years there has been many projects focused at each of these components and combinations of the components

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into a transportation system approach. The system was demonstrated from a commercial perspective in 2004 at the Port of Tacoma and demonstrated significant results in increased efficiency: Throughput efficiency increases of from 140% to 300% for container movement.

The next phase was to use the Agile Port System to conduct a military deployment using the processes developed for the commercial demonstration and in keeping with CCDoTT's principle of dual-use military and commercial applications.

The project started well. Utilizing the previously established project and demonstration teams, the demonstration plan was updated and coordination established. The team included the necessary commercial and military support organizations located in the Tacoma, Fort Lewis and Seattle areas. The demonstration was dependent on the designation of a deploying military unit (Brigade size or comparable) to establish a deployment schedule and authorization to conduct the demonstration by USTRANSCOM and SDDC. Personnel turbulence within USTRANSCOM and SDDC initiated a series of briefings and multiple rescheduling of briefs that lead to extended delays. The delays precluded the scheduling of a demonstration within the period of performance of the current Cooperative Agreement. Ultimately, an approach was worked out with USTRANSCOM whereby a deployment in Savannah was monitored to acquire data that was used to develop a baseline case of current deployment processes, timing and costs which was then used in a simulation that compared current military processes to simulated APS processes. The result was a comparison of the two approaches that provided a clear difference between the two approaches. Based on the efficiencies demonstrated in simulation, a decision was made to go ahead with the demonstration as soon as an appropriate deployment can be designated. The project was put on hold awaiting the designation of the participating military organization.

Concerns over the potential disruption of a real world military deployment continued to prevent the demonstration from occurring. With the concurrence of the Office of Naval Research and the USTRANSCOM, CCDoTT developed a course of action that would meet the objectives of study by incorporating the results of the commercial demonstration, the significant volume of deployment data acquired from actual deployment operations and the additional data focused on supporting agencies, military units, and military/commercial support organization collected directly from deployment supporting sources. All data collected over an eight year period was reviewed and used to support a comprehensive simulation comparing the APS processes to current military deployment processes. In the absence of an actual exercise of the APS processes with a deploying operational unit, this approach provided the best available comparison of the deployment processes. The study's final report was then refocused to support an APS Joint Capability Technology Demonstration (JCTD). The proposed APS JCTD is to begin the process of deploying immediate APS processes, information management systems, and advanced ship loading technology to support the recently approved Expeditionary Theater Opening (ETO) Joint Doctrine; Organizations; Training; Materiel; Leadership and Education; Personnel; and Facilities (JDOTMLPF).



Agile Port and High Speed Ship Technologies

**FY05 Final Summary Report
Vol. I - Projects 1, 2 and 7**

CCDoTT FY05 Project Summaries

Project 05-1: Technical Coordination and Planning

Author: Stanley Wheatley, Principal Investigator, Center for the Commercial Deployment of Transportation Technologies, 6300 State University Drive Suite 220, Long Beach, CA 90815

Abstract: Technical Coordination and Planning encompasses all activities required to ensure the efficient and effective performance of each project, ensuring quality performance and timely completion within budget, provide coordination with Sponsor, between research partners, between projects and consultants, coordinate with stakeholders to insure alignment to future projects, and provide mid-term planning to insure the continuity of multi-year objectives.

Technical Objective:

The CCDoTT Program is a collection of related projects, not just a single project. This project identifies and coordinates diverse advanced technological projects from an extended set of research partners within CSULB, other universities, governmental agencies and commercial ventures. CCDoTT uses its assets to validate research findings and coordinate them into a focused program of action for the advancement and dissemination of transportation technologies. Many of the projects are multi-year projects requiring planning and coordination over beyond the limits of a single fiscal year.

Technical Approach:

Project activities include all technical, managerial, and coordination efforts required to ensure the efficient and effective performance of the current and out-year CCDoTT projects. This includes: ensuring quality performance and timely completion within budget for all project tasks; establishing a framework for the following year's activities to advance technological capabilities; and incorporating end user participation into the program development in order to ensure a high probability of eventual operational implementation. Deliverables on this project consist of ONR reporting requirements as set forth in the Cooperative Agreement.

Project Summary:

Technical Coordination and Oversight is continuous throughout the life of each set of studies and is a critical in gaining the full value added that can be achieved by integrating related portions of separate and/or multi-year projects. During this reporting period the multi-year development of cargo movement simulations combined with requirements for simulation of terminal, freight corridor and remote ports site operations allowing the significant synergy both between the projects and the expansion of the simulations. The advances in support of the projects and the expansion of the simulation models from multiple sources of cargo movement operations clearly demonstrates the what can be accomplished by a single coordinating authority, CCDoTT, working in several related projects simultaneously. Similar situations exist in our Computational Fluid Dynamics and Optimization work integrating with high-speed ship development. The point to be made is that this project goes far beyond routine project management and is listed as a separate project due to the additional value achieved.

Task 1.1 Project Oversight:

This task encompassed all activities required to ensure the efficient and effective performance of current year CCDoTT projects. Specific activities included: performing technical oversight and evaluation of all milestones and deliverables on each project; collaboration with research partners to develop appropriate corrective actions on each project milestone or deliverable by CCDoTT technical review experts; conducting Interim Project Reviews with all projects on a routine basis; interface with ONR Project Manager and designated Subject Matter Experts; review and coordinate proposed Project modifications.

Task 1.2 Program Development and Planning:

This task encompassed maintaining the continuity of past and current projects and the development of potential out-year projects. Specific activities included: assessing future program potential of current projects; evaluating technological innovations and their dual-use potential; coordinating inter-partner actions in support of projects; coordinating model/simulation development to support multiple projects; strategic planning to ensure continuity of ongoing/multi-year projects and coordination of long range goals into an End Year Program Plan; identifying and prioritizing projects for selection in the next fiscal cycle (FY06/07) through an End Year Program Plan; interface and coordinate the recommendations of the CCDoTT Advisory Committee linking planning and Technology Transition functions.

Essentially, all the program management tasks of an ongoing advanced technology program.

Significant Results:

The FY05 Program resulted in the completion of eight major projects supporting High Speed Ships and Agile Port issues of importance. They are:

- *Automated Multidisciplinary Design Optimization for Multi-Hull Vessels*
- *Waterjet Self-Propulsion Model Test for Application to a High-Speed Sealift Ship*
- *High Speed Trimaran Technology Development and Application for Benchmark Design Validation of Heavy Air Lift Seabasing Ship (HALSS)*
- *Development of a Route/Mission Dependent Prediction Program for Rational Structural Dynamic Loads for High Speed Sealift Applications*
- *Summary Review of Alternative Shipboard Powering Systems for Naval and Regulatory Review*
- *The Evaluation and Implementation Plan for Southern California Maglev Freight System*
- *Pacific Northwest Agile Port System Demonstration*
- *Feasibility Assessment of Short Sea Shipping to Service the Pacific Coast*

Problems:

The primary problem has been the delays to the Agile Port System Demonstration that resulted in the extension of this project to maintain necessary administrative support to completion.

Next Steps:

The Technical Coordination and Planning Project provides the management support to plan, coordinate and conduct the studies approved for that Fiscal Year. As such, each fiscal year program requires a Technical Coordination and Planning Project to insure the accomplishment of each project and the program objectives. With the submission of this report the FY05 CCDoTT Program is complete.

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1. Wheatley, Stan. "Initial Program Plan". CCDoTT, CSULB Foundation. May 13, 2005
2. Monthly Status Reports. CCDoTT, CSULB Foundation. December 2005 - February 27, 2007.
3. Wheatley, Stan. "Final Program Plan". CCDoTT, CSULB Foundation. May 11, 2006.
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7. Wheatley, Stan. "Final Summary Report on FY 2005 Projects Vol. II". CCDoTT, CSULB Foundation. December 31, 2009.

Presentations:

1. CCDoTT Presentation for Lt. Gen. Robert Dail, TCDC, USTRANSCOM, Scott AFB, IL. January 26, 2006.

Press:

1. "CSULB Receives \$4.2 Million Grant for CCDoTT." Inside CSULB. CSULB University Relations and Development. Vol. 58 No. 3. March, 2006.

Glossary of Acronyms:

CCDoTT - Center for the Commercial Deployment of Transportation Technologies
CSULB – California State University, Long Beach
ONR – Office of Naval Research

Project 05-2: Technology Transition and Outreach

Author: Steven Hinds, Program Administrator, Center for the Commercial Deployment of Transportation Technologies, 6300 State University Drive Suite 220, Long Beach, CA 90815

Abstract: The Technology Transition project is designed to meet the needs of the stakeholders, with the goal of reaching end users who can develop products or processes aimed at improving commercial competitiveness and military capability. It encompasses extensive outreach activities aimed at remaining in the forefront of technological advances, and acting as a clearinghouse for stakeholders in the transportation industry. Technology Transition works in close collaboration with the Technical Coordination and Planning project to provide critical feedback and direction for CCDoTT's program of action.

Technical Objective:

This project recognizes that Technology Transition success requires more than the standard outreach processes that are the foundation of our past approach. The transmission of new ideas, technologies and concepts requires an aggressive multi-directional approach that not only pushes the information out, but, implements an equally aggressive feedback process to insure we meet the requirements of the commercial and military stakeholders and ultimately the end users of the R&D effort.

Technical Approach:

Technology transition activities are accomplished through a variety of methods such as: hosting regional conferences and meetings, conducting technical interchange meetings with CCDoTT's Advisory Board, giving presentations to stakeholders and potential end users, making presentations to professional organizations, maintaining a website with current and past project results, and publicizing new technology through the press and periodical publications.

Project Summary:**Task 2.1 Planning, Evaluation and Recommendations for the Future:**

The Technology Transition planning process includes the development and implementation of an initial Technology Transition Plan to be used as a guide for the current year. The initial Plan and resulting outreach activities were evaluated and the conclusions provided in an updated Technology Transition Plan for new and ongoing projects.

Task 2.2. Meetings, Conferences and Presentations:

Technology Transition events were held by CCDoTT for the public and/or invited guests. CCDoTT hosted two major conferences: one on the East Coast providing the opportunity to brief partners, academia, military and government representatives; and another on the West Coast specifically designed for outreach activities within the local transportation community. Meetings

with CCDoTT's Advisory Board were held in conjunction with these events and on an as needed basis for feedback and guidance. CCDoTT participated in many meetings and events during the course of this project providing the opportunity for presentations of CCDoTT technologies to other organizations.

Task 2.3. Information Dissemination/Publications:

This task consisted of the public distribution of current and past project results, publication of other CCDoTT material necessary for the success of Technology Transition activities, and special reports as requested. This tangible information is critical to the effective communication of ideas to Sponsors and prospective end users when discussing the concepts and potential viability of CCDoTT projects.

Significant Results:

The significant results of the project are to ensure that CCDoTT is sensing the evolving needs in the industry, is pursuing projects that respond to these needs, and is adequately promulgating the results of these projects so that the greatest benefit can be reaped. The goal is to expand the user base and identify vital new research projects. That is being accomplished.

Problems:

The primary problem has been the delays to the Agile Port System Demonstration that resulted in the extension of this project to maintain necessary administrative support to completion.

Next Steps:

To continue the Technology Transition mission to adapt the program to the needs of the Navy, expand the end user base, and transfer the newly developed technologies to end users.

Bibliography of Project 05-2 Deliverables:

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Presentations:

- CCDoTT Presentation for SNAME Maritime Technology Conference Technical and Research Session. George R. Brown Convention Center, Houston, TX. October 20, 2005.
- CCDoTT Presentation for USMMA Department of Engineering. U.S. Merchant Marine Academy, Kings Point, NY. April 27-28, 2006.
- CCDoTT Presentation for Sean Connaughton, Maritime Administrator. MARAD, Washington, DC. September 29, 2006.

Press:

- "Transportation Technologies Center Named for James Ackerman". CSULB Foundation Annual Report. CSULB Foundation, Long Beach, CA. December 2005.
- "Maglev Technology 'Conveys' Port Transportation Solutions". Newsflash. College of Engineering, California State University, Long Beach. Cover page. Spring 2006
- Hanson, Kristopher. "Engineers Tout Maglev at Ports" Press-Telegram. November 17, 2006.
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Glossary of Acronyms:

CCDoTT – Center for the Commercial Deployment of Transportation Technologies

CSULB – California State University, Long Beach

IMPACT – Innovative Maritime Partnerships Advancing Cargo Transport

MARAD – Maritime Administration

ONR – Office of Naval Research

SNAME – Society of Naval Architects and Marine Engineers

USMMA – United States Merchant Marine Academy

Project 05-7: Pacific Northwest Agile Port System Demonstration

Authors: Shannon McLeod and Ed Savacool, TranSystems Corporation, 150 Boush St., Suite 1000, Norfolk Virginia, 23510

Abstract: In the past ten years, the Department of Defense (DoD) has relied heavily on commercial ports to deploy forces from the U.S. to the current military operational areas in Iraq and Afghanistan. To improve commercial terminal capacity and assure military force deployment port accessibility, the Center for the Commercial Deployment of Transportation Technologies (CCDoTT), the Office of Naval Research (ONR), and TranSystems have developed and refined an Agile Port System (APS) concept through modeling, simulation, experimentation, and demonstration. As defined by the U.S. Maritime Administration (MARAD), an APS is a marine terminal or system of terminals capable of accommodating varying cargo quantities and types while minimizing operation interruptions within the terminal. An APS design must also be capable of dynamic planning, replanning, and adaptation to changes in cargo flow (i.e. cargo dwell times, arrival/departure patterns of truck and rail cars, vessel scheduling).

TranSystems has focused on analyzing a specific dual-use, commercial and military APS concept for CCDoTT and MARAD: the Efficient Marine-Rail Intermodal Interface (EMRII). The EMRII system, as depicted in Figure 1, includes three major infrastructure components: a rail oriented marine terminal called an Efficient Marine Terminal (EMT), an inland intermodal terminal called Intermodal Interface Center (IIC), and a Dedicated Freight Corridor (DFC) that connects an EMT and IIC. After a four year period of developing the initial APS requirements, a successful demonstration of the EMT component of the EMRII design was conducted under real commercial operating conditions at the Port of Tacoma's Washington United Terminal (WUT) in 2003 (CCDoTT FY01 program).

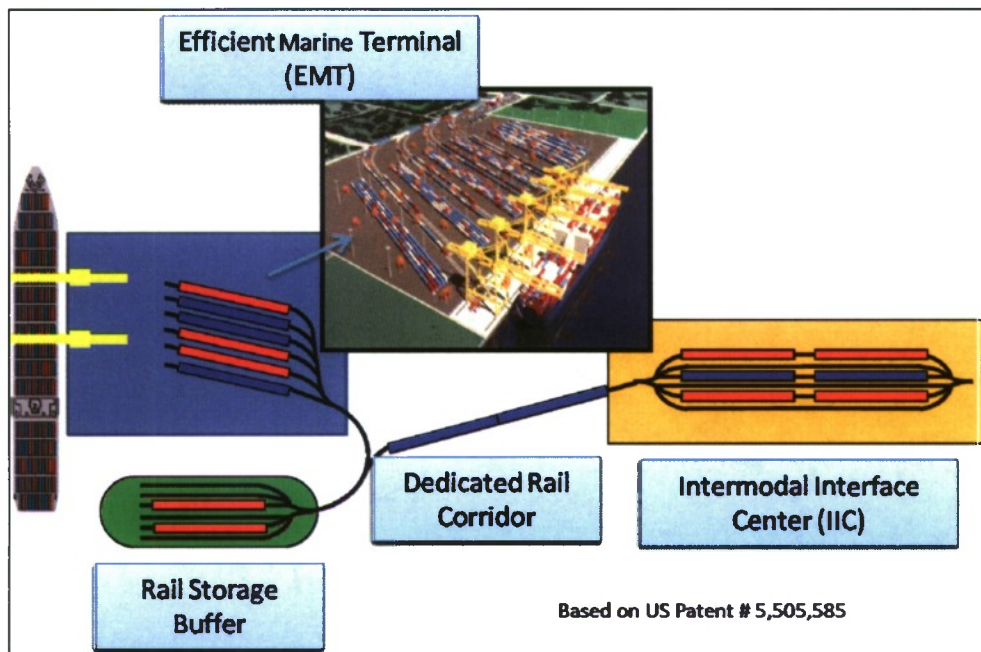


Figure 1 - Efficient Marine/Rail Intermodal Interface (EMRII) System

The demonstration determined that implementation of the EMT system and associated processes have the potential to achieve operating cost savings of approximately 40 percent. This equates to an estimated cost savings of \$350,351 per single vessel while handling 6,000 containers or 12,000 TEU. Additionally it was determined that the average U.S. port could realize up to a 300 percent increase in throughput capacity through the implementation of the EMT. After successfully completing the commercial EMT demonstration and identifying significant capacity savings, it became clear that a full-scale demonstration of the entire EMRII system must be performed and analyzed to realize the maximum potential benefits of the APS concept.

Overview of the Preliminary Military Demonstration Scenario:

The demonstration was planned to begin with a commercial container ship loading cycle, followed immediately by the deployment of a military force loading on a strategic sealift ship through the same terminal as the commercial demonstration. Because of concerns about incurring potential delays to a military force deployment, the commercial portion of the demonstration was deferred to enable an initial stand-alone APS demonstration of the reengineered military deployment processes.

After the commercial demonstration was completed in 2003, analysis and planning was initiated for the APS military experimentation and demonstration. The plan called for a military force movement from one or more Power Projection Platforms (PPP) to a commercial strategic port such as the Port of Savannah. The basic commercial concepts of the EMRII system would be employed during the military demonstration. As depicted in Figure 2, the primary infrastructure associated with the EMRII that could be selectively employed would be the IIC. In addition to the IIC, a rail storage buffer near the strategic port could be employed depending on the operational requirements. The IIC would only be employed for unit/equipment deployments from a PPP other than Fort Stewart.

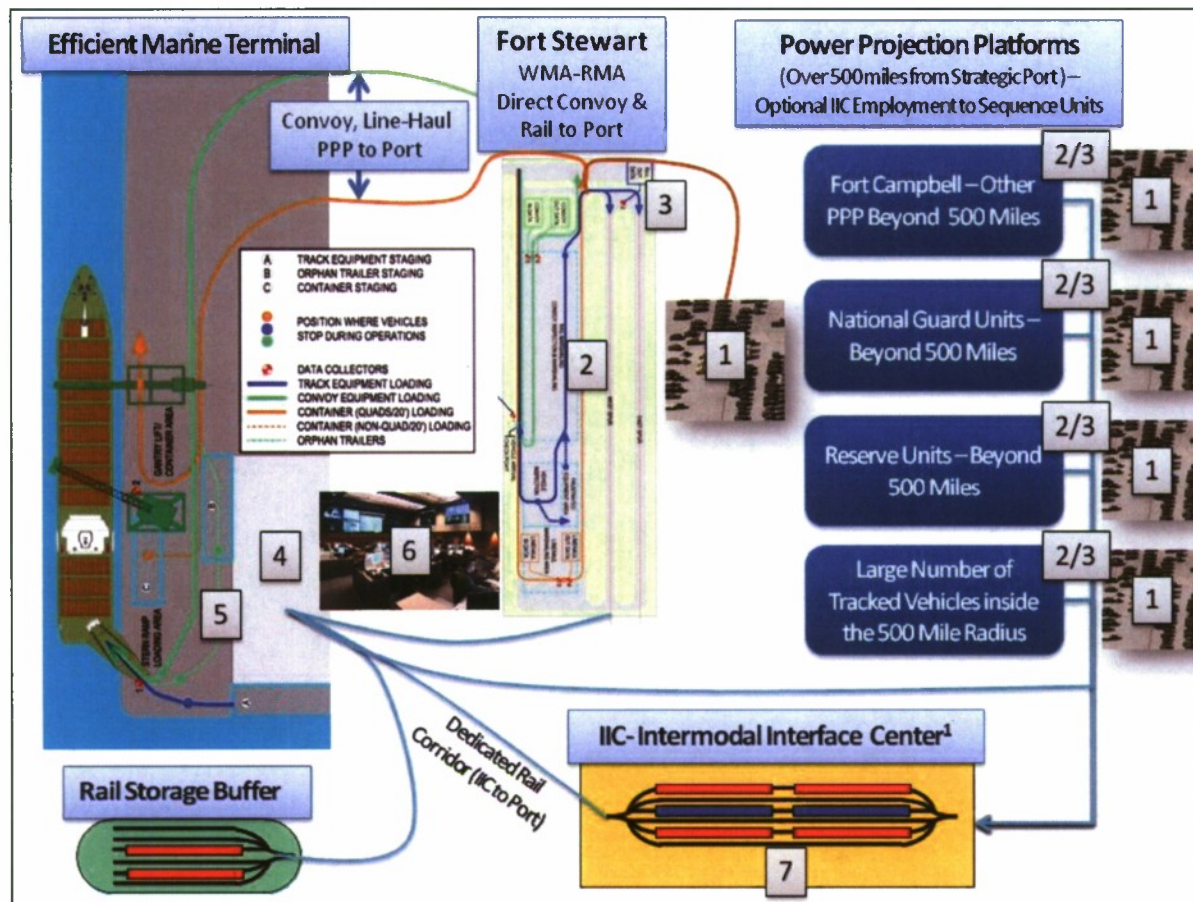


Figure 2 - Military Component of the APS - EMRII System

The demonstration scenario would begin when the Joint Force Requirements Generator (JFRG II) provided deployment requirements were made available in Transportation Coordinators' - Automated Information for Movements System II (TC-AIMS II). This deployment planning information would be used to develop the initial ship stowage plan. However, during deployment execution, the initial plan would require updating numerous times as deployment plans are changed, equipment is substituted or becomes inoperable, and other movement disruptions occur. The following is an overview of the demonstration scenario based on the revised business processes that would be demonstrated (no APS information management system capabilities would be employed):

- Based on the Integrated Computer Deployment System (ICODES) stow plan developed by the APS team located at the PPP, the optimal ship loading sequence (see Figure 3) would be calculated and recalculated as required to support:
 - Organizing marshalling and staging areas at the PPP and port using ICODES.
 - Establishing the movement sequence to port based on ship loading plans.
 - Determining International Longshoremen's Association (ILA) labor requirements.
 - Supporting the re-planning of ship stow and load plans as changes occur; including changes in configuration of marshalling and staging areas; and sequenced unit equipment movement to port.
- Employ revised convoy and rail planning and movement procedures – based on reverse planning from the ship stow/load plan as outlined above. Rail, convoy, and line-haul

movements will be programmed simultaneously according to the optimized ship loading sequence.

1. Ship-loading pattern established by ICODES stow plan and loading model results
2. Each stevedore work period is planned in advance so the correct gang structure is available at the start of each time period as depicted below
3. The maximum number of decks and holds are loaded concurrently through each point of entry to include lift points
4. Load plan is used to reverse plan the sequenced and timed movement of each unit from the unit motor pool to the port of embarkation
5. ICODES will be used to develop all marshalling area and staging area templates

Day 1 - Loading Period One: 0700 -1200

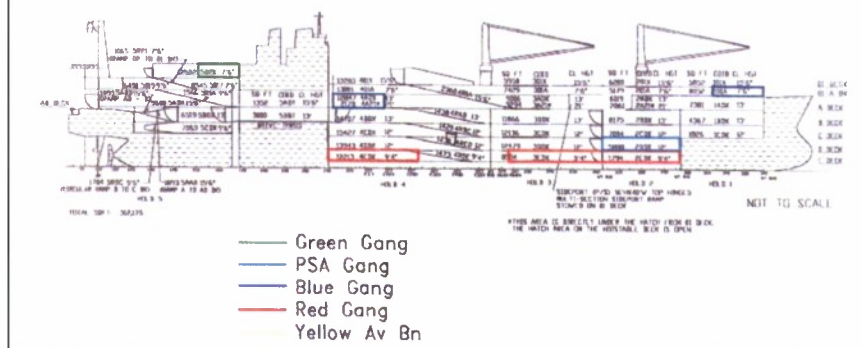


Figure 3 - Ship Load Planning Process

Fort Stewart deployments would continue to use the same direct rail shipment routes as currently employed. The only changes associated with Fort Stewart rail deployments would involve planning, coordination, and execution processes currently being coordinated with CSX and Norfolk Southern. Surface Deployment and Distribution Command (SDDC) and the Class I railroads would collaborate on the proper integration of rail shipments from Fort Stewart and other PPPs. Units deploying from a PPP such as Fort Campbell or Reserve and National Guard elements more than 500 miles from the strategic port would be selectively processed through the IIC. The IIC provides better control over proper integration and sequencing of equipment to the port for seamless load plan integration with Fort Stewart unit equipment and sustainment. The intent is to sequence the flow in accordance with the optimal ship loading pattern. One SDDC traffic manager and one SDDC ICODES representative per shift would be required to oversee IIC operations.

Military Baseline Deployment:

In early 2007, RADM Mark D. Harnitchek, USN issued a letter from the U.S. Transportation Command (USTRANCOM) to CCDoTT expressing USTRANCOM's level of commitment to the APS Demonstration program on the condition that a three-step approach be taken to benchmark the current deployment process and simulate the anticipated APS deployment operations to identify anticipated benefits prior to committing to the military APS demonstration operation. The letter also requested an approach for developing the required work-around processes needed to perform the APS military demonstration.

USTRANSCOM's requirement to establish a current force deployment baseline was accomplished by collecting detailed deployment process data in September 2007. The military analysis included a major data collection effort conducted during the combat deployment of the 4th Brigade of the 3rd Infantry Division from Fort Stewart, GA to Iraq. The data collected was used to complete the military force deployment benchmarking process.

APS Demonstration Redefined:

The follow-on plan was to apply APS principals to an actual military deployment to demonstrate the processes and potential benefits of an APS operation. Since the demonstration was to be associated with a deployment of Army combat forces to an active Joint Operations Area in Iraq or Afghanistan, there was considerable concern over potential disruptions to the deployment timeline or impacts on the deploying unit soldiers. The required planning redirections initiated by USTRANSCOM and concerns raised by the Army Forces Command (FORSCOM) caused extensive delays that prevented the military demonstration from being completed within the allowable APS project period of performance and led to the decision to transform the demonstration into a Joint Capabilities Technology Demonstration (JCTD).

The JCTD is a pre-acquisition activity, spanning from two to four years. It is designed to provide the military user an opportunity to assess the APS and determine the military utility before deciding to adapt the revised business and functional processes. JCTDs are intended to exploit mature and maturing technologies to solve important military problems and to more fully develop the associated operational processes and concepts to permit the technologies to be fully exploited. These processes and operational concepts are then evaluated in military exercises on a scale large enough to clearly establish operational utility and system integrity. Emphasis is on technology assessment and integration rather than technology development. A JCTD becomes a candidate for transition following a successful military utility assessment.

To better frame the requirements for a JCTD with the Joint Forces Command (JFCOM), USTRANSCOM, and FORSCOM, the APS program provided additional business and functional process analysis using modeling, simulation, and analysis (MS&A). TranSystems developed the additional MS&A with the objective of preparing a dynamic simulation of an APS military deployment based on actual business operating principals, infrastructure analysis and process times. This simulation was used for run-time experimentation under a variety of scenarios to develop a knowledge base of how the logistics and technology would react under actual operating conditions.

Revised movement planning, control, and ship loading processes were designed and validated through modeling and simulation to better sequence force movements from the point of origin, increase transport loading rates, reduce the deployment impact on both deploying units and commercial ports, and improve force protection.

From the start of CCDoTT's efforts, it has been generally agreed that port productivity, regional congestion concerns, environmental issues, and military force deployment requirements establish the need for adding more agility to marine terminal operations within the U.S. However, agreement with the APS concept has not been sufficient to gain the confidence of the stakeholder

community to take action. While effective modeling and simulation has demonstrated the full potential value of a dual-use APS, without the dual-use concept being physically proven, concerns remain about its true viability especially within the military community.

Technical Objective:

This APS program was designed to provide a proof of concept demonstration and assessment by using real infrastructure, cargo and actual commercial cargo and military deployment operations. At the conclusion of the demonstration and follow on analysis, this series of projects would summarize the EMRII concept's viability for commercial and military APS operations and the ability to deploy military cargo with higher efficiency, lower cost and more flexibility while minimizing disruption to commercial operations.

The CCDoTT recommended approach to collaboratively plan the full scale demonstration was as follows:

1. Establish an agreed upon "as-is" deployment baseline prior to a full scale military deployment demonstration.
2. Obtain concurrence on the demonstration objectives currently outlined as follows:
 - a. Enable a marine terminal to accommodate military load out operations while minimizing disruption to commercial operations.
 - b. Reduce the amount of terminal property required during military loading operations to twelve acres or less (the current normal requirement is 20 to 30 acres).
 - c. Provide the ability to plan, track, and dynamically re-plan force deployments through a strategic port.
3. Once general concurrence with step 2 was obtained, the next step was to establish a series of planning meetings to revise, as required, objectives, tasks, conditions, and standards that were to be associated with the full-scale demonstration.
4. Model the proposed deployment and collaboratively use the model with USTRANSCOM to validate the plan.
5. Obtain demonstration concept concurrence or approval as appropriate from USTRANSCOM.
6. After USTRANSCOM concept concurrence, obtain support for a full-scale Agile Port demonstration.

Military Demonstration Objectives:

An objective of the military demonstration was to validate the force deployment business and functional process changes established during the analysis before finalizing the military APS metrics and system-of-systems architecture.

The APS force deployment demonstration sub-objectives were to evaluate the following capabilities:

- Improved force deployment velocity through functional processes that support the ability to properly plan, validate, track, and dynamically re-plan force deployments.

- Assured strategic port access by minimizing the impact of force deployments on commercial commerce for a Large, Medium Speed, Roll-on/Roll-off (LMSR) load by:
 - Decreasing POE Operations from 14+ Days to no more than 4.5 Days.
 - Decreasing POE Equipment Footprint from 250,000 SF to 150,000 SF.
 - Decreasing POE Storage Area from 18 acres to 10-12 acres.
 - Decreasing Total Terminal Area used from 35+ acres to 20 acres.
- Improved force protection through reduced equipment footprints and better tracking.
- Improved data quality using advanced, structured processing procedures.
- Provide an opportunity for identifying additional process improvement and system infrastructure improvements through the demonstration planning process, which is being considered a Functional Area Analysis.

Technical Approach:

To demonstrate the value of the APS for military use, it was decided that the deployment of a Brigade Combat Team (BCT) would provide the most benefit to all stakeholders. To prepare for the military demonstration, the following multi-phase preparation approach developed by ONR-CCDoTT and endorsed by the US Transportation J5 was completed by TranSystems:

1. Phase 1, completed in December 2007 established the deployment baseline micro and macro data set to support APS model validation.
2. During Phase 2 APS models and simulations were validated using baseline force deployment data. After validating the APS models, force deployment processes were modeled to evaluate: the revised APS deployment processes; risks associated with the processes; and the overall military APS.
3. At the completion of Phase 2, the APS data collection, modeling results, revised business and operating procedures, stakeholder training requirements, and demonstration concepts were presented to USTRANSCOM for review and approval.

Project Summary:Referenced Deliverables:

The following descriptions of each submitted deliverable represents a task in the FY05 Pacific Northwest Agile Port System (PNW APS) Demonstration project:

Task 7.1 Pre-demonstration Planning, Coordination and Cargo Repositioning

Deliverable 7.1a: *Summary Report of Start-up and Planning Activities*. This report included a summary of the organizations, their roles and duties, and the preplanning efforts that were completed to gain each participant's commitment to the execution of the Pacific Northwest Agile Port System (PNW APS) Demonstration. The report described the result of the initial planning and the decision by the USTRANSCOM to continue to evaluate the APS concept through the observation of a military deployment operation.

Deliverable 7.1b: *USTRANSCOM Letter of Commitment*. A letter of commitment from Rear Admiral Harnitchek, USTRANCOM to support and participate in the demonstration was delivered to CCDoTT.

Task 7.2 Military Baseline Deployment Data Collection

Deliverable 7.2: *Baseline Military Planning, Execution and Data Collection/Reduction Report*. This report described the actual data collection effort conducted during the deployment of the 4th Brigade, 3rd Infantry Division in September 2007. The report described how the deployment observation allowed the demonstration team to collect performance data and set a baseline understanding of deployment operations that was later compared to potential APS operations. The summary of deployment observations and data collection efforts contained in this report included a detailed description of the PPP Operations; Port of Embarkation (POE) operations; data collection; and data reduction analysis.

Task 7.3 Military Baseline vs. APS Operations Modeling and Comparison

Deliverable 7.3: *Baseline Military Simulation Modeling and Comparison Report*. This report described the potential APS benefits and estimation of demonstration expectations derived through the use of computer simulation analysis. Included were the potential benefits of implementing APS operations for military deployments and the identification of special procedures or work around processes needed for the full-scale APS Demonstration. The report included a comparison of current vs. APS military deployment operations that was presented to USTRANSCOM, FORSCOM and JFCOM for their consideration and decision process.

Task 7.4 APS Planning/Coordination

Deliverable 7.4: *Planning and Coordination Report*. This report provided a summary of the planning, analysis, and coordination completed to design, develop, and execute the military portion of the full-scale, dual-use APS demonstration along with a summary of the APS concept development and commercial demonstration. As described in this report, the delays associated with obtaining the necessary approval for the military force deployment demonstration required the program to be restructured. The demonstration is now being proposed as a JCTD.

Task 7.5 APS Data Collection and Model Development

Deliverable 7.5: *Study Documentation Report and Operating Simulation Model*. This technical report provided detailed information on the military force deployment modeling, simulation, and analysis associated with the comparison of the baseline to the reengineered APS processes resulting from Subtasks 7.5.1 – 7.5.4. The report described the restructured APS approach, which was to immediately refine the modeling and simulation scope to include the scheduling of unit equipment flow from the motor pool through ship loading.

Subtask 7.5.1 APS Simulation Coordination

The product of Subtask 7.5.1 was a brief narrative that presented a clear definition of expectations and desired results from the simulation modeling experimentation and

milestone agenda for accomplishing the work. Principal contact points were established and authorizations for data collection and business process reengineering at Fort Stewart were initiated.

Subtask 7.5.2 Development of Model Architecture:

The results of Subtask 7.5.2 were presented in a report section with a graphical diagram of the model processes and documentation of the data and methodologies to be used. A discussion of quality control and verification methods was included and potential limitations to the model were listed. General software documentation and descriptions were provided as an appendix to the report.

Subtask 7.5.3 Collection of Additional Data:

In addition to the data necessary for building and running the deployment simulation model, the products of Subtask 7.5.3 included a process map that documented the flow of information, material and transport vehicles from the “fort to the port,” as well as procedures involved in marshalling and ship-loading in Savannah.

Subtask 7.5.4 Simulation Model Development:

The product of Subtask 7.5.4 was an operating simulation model of the processes involved in deploying material and vehicles from Fort Stewart to the Port of Savannah. It also included documentation of the model development, input variable ranges and expected output data.

Significant results:

The simulation model analysis and comparison performed of the current (as-is) and APS (to-be) operations provided the following conclusions:

- There will be no increase in operating costs to perform the APS demonstration.
- A significant decrease (500%+) in impact to the POE will be experienced.
- A significant increase (500%+) in required PPP area for marshalling equipment will be required.
- It is possible to increase vessel loading rates under APS and current deployment operations equally.
- Fuel consumption and air emissions from equipment will be similar during APS operations as they are during current operations.

As the force deployment data collection and analysis confirmed, the current processing of rail and convoy movements to the port are completed in a more linear manner, rather than dispatching equipment to port in the order of planned loading. As an example, at least 95 percent of equipment is marshaled on the marine terminal before ship loading is initiated. This is caused by a number of factors, including the late nomination of a ship to be used for deployment, stove piped information management systems, poor data quality, and less than optimal business and functional processes. The current force movement procedures, using linear dispatching practices from the PPP, results in extended force deployment times and significant disruption to normal commercial operations by occupying large areas of the marine terminal for equipment marshalling over an extended period of time.

Problems:

After completing Task 7.1 the demonstration team proceeded to finalize the military commitment received from the 833rd TTB in Seattle and from Fort Lewis with a commitment from USTRANSCOM. This process began in the Fall of 2005 and was initially delayed by USTRANSCOM's concerns regarding the ability to control the movement of military cargo during APS operations.

In early 2006, APS demonstration planning began in earnest with the USTRANSCOM J5 staff. Several meetings at Scott Air Force Base led to the conclusion that the demonstration required restructuring to align the APS objectives with the current operational tempo of the Joint Forces. This resulted in making the deployment plans more flexible so that the demonstration could be held at any strategic port where the opportunity for a demonstration was available. The use of any enhanced information management systems that might not function as expected during the deployment had to be deleted from the planning completely. The focus had to be solely on changing business and functional processes and the development of "demonstration work around solutions" to mitigate the risk of delaying or disrupting a force deploying to a combat zone.

After completing several versions of the APS military force deployment demonstration plan, a demonstration decision meeting was scheduled and held during March 2007 with Rear Admiral Mark D. Harnitchek, then the USTRANSCOM J5 Director for Strategy, Policy, Programs, and Logistics. He has since been promoted to Vice Admiral and is the Deputy Commander, USTRANSCOM. As directed by Vice Admiral Harnitchek, the purpose of the decision brief was threefold and focused on:

- Results of the observation of a current force deployment process,
- Comparison of current vs. APS deployment operations, and
- Identification of required work around processes needed to perform a full-scale military deployment demonstration.

The briefing and follow-on discussions led to the following decisions:

- The concept to relieve port congestion was found to be conceptually sound.
- CCDoTT was to continue demonstration coordination with:
 - Ms. Patricia Kelly, the former Army G4, Director, US Army Directorate for Force Projection & Distribution; and
 - FORSCOM.
- Mr. Keith Robbins, SDDC G5 was designated the USTRANSCOM-SDDC coordination focal point.

Subsequent to the decision meeting, and as directed by USTRANSCOM, the APS team began a series of coordination meetings with the SDDC G5 Strategy, Plans, Programs and Policy Directorate. The coordination was focused on selecting a scheduled force deployment to observe for business process and movement data collection. After a series of planning meetings, the SDDC G5 nominated the 4th Brigade, 3rd Infantry Division deploying from Fort Stewart, Georgia through the Port of Savannah during September 2007 for the data collection effort. The military deployment observation was focused on the collection of performance data, which was

used to set a baseline understanding of deployment operations and complete the first requirement by USTRANSCOM.

Once the baseline observation was complete, a simulation of the anticipated military APS operations was performed in early 2008. A post analysis demonstration planning meeting was held with the 833rd Transportation Terminal Battalion (TTB) in Seattle, Washington in March 2008. The focus of this meeting was the potential work around processes required for the APS demonstration. During the 833rd TTB meeting, the leadership and operational staff of the battalion unanimously concurred that the high-level work around processes proposed were viable and agreed to operationally support an APS demonstration if approved by the appropriate commands.

The original plan, coordinated with USTRANSCOM, the SDDC, and FORSCOM was focused on identifying an Army battalion task force scheduled for operational deployment to undergo APS operations to enable a force deployment demonstration. The final demonstration details were to be developed once the unit location and size were determined. However, approval for the demonstration could not be obtained from FORSCOM in time to complete the military demonstration before the end of the project period of performance. Planning coordination meetings with the military had continued for nearly two years before it was concluded that the key FORSCOM and USTRANSCOM staff officers could not justify the potential risks of delaying an actual force deployment operation during a demonstration of the APS. The risk of potential disruptions to the deployment flow to a combat theater and the impact that might have on the service members was a risk FORSCOM was unwilling to accept.

The coordination during Task 7.4 resulted in the proposed restructuring of the current project. In 2009, the remainder of the project was restructured to validate the APS processes through business process reengineering and infrastructure analysis supported by modeling and simulation. The processes reviewed for possible reengineering focused on planning and execution from the unit motor pool through the installation rail, wheeled vehicle, and line haul marshalling areas. No actual force deployment was associated with this analysis. The focus was on working with key force deployment stakeholders primarily within SDDC and the Fort Bragg ITO to reengineer as-is processes to fit the requirements of the APS concept. The APS model and simulation were updated to reflect the reengineered business processes developed. This included changing the ship loading sequence to reflect the optimal ship and deck loading order for the type of ship being loaded. In the case of current analysis, the USNS Bob Hope, a LMSR ship.

Next Steps:

The data collected during this modeling simulation will be analyzed and results presented in a summary Final Report as a part of the FY06 Agile Port System Demonstration project. Outyear planning for future developments of this project will be presented in the FY06 Final Summary Report.

Bibliography of Project 05-7 Deliverables:

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4. "Baseline Military Simulation Modeling and Comparison Report." TranSystems Corp. with CCDoTT, CSULB, Long Beach, CA. October 9, 2008.
5. "Planning and Coordination Report." TranSystems Corp. with CCDoTT, CSULB, Long Beach, CA. Included in "Study Documentation Report" below.
6. "Study Documentation Report." TranSystems Corp. with CCDoTT, CSULB, Long Beach, CA. December 31, 2009.

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- Mongelluzzo, Bill. "Test of Agile Port Project Shows Promise in Tacoma". Journal of Commerce. November 10, 2005.
- Mongelluzzo, Bill. "The Agile Port". Journal of Commerce. Pages 14-18. December 11, 2006.

Glossary of Acronyms:

APS – Agile Port System

BCT – Brigade Combat Team

CCDoTT – Center for the Commercial Deployment of Transportation Technologies
DFC – Dedicated Freight Corridor
DoD – Department of Defense
EMRII – Efficient Marine-Rail Intermodal Interface
EMT – Efficient Marine Terminal
FORSCOM – U.S. Army Forces Command
ICODES – Integrated Computerized Deployment System
IIC – Intermodal Interface Center
ILA – International Longshoreman’s Association
ITO – Installation Transportation Office
JCTD – Joint Capabilities Technology Demonstration
JFCOM – U.S. Joint Forces Command
JFRG II – Joint Force Requirements Generator
LMSR – Large, Medium Speed Roll-on/Roll-off
MARAD – U.S. Maritime Administration
MS&A – Modeling, simulation and analysis
ONR – Office of Naval Research
PNW – Pacific Northwest
POE – Port of Embarkation
PPP – Power Projection Platform
SDDC – Surface Deployment and Distribution Command
SM21 – Strategic Mobility 21
TEU – Twenty foot equivalent unit
TC-AIMS II – Transportation Coordinator’s Automated Information for Movements System
Version II
TTB – Transportation Terminal Battalion
USNS – U.S. Naval Ship
USTRANSCOM – U.S. Transportation Command
WUT – Washington United Terminal